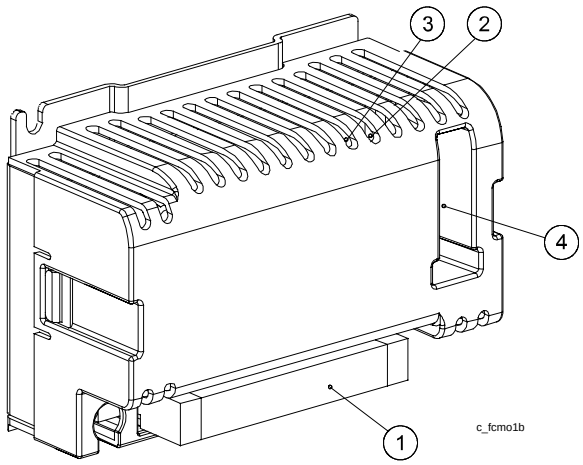
CMX 007



Instruction and Service Manual
Adjustable Frequency Crane Control

Keep the instructions in a safe place for future reference.

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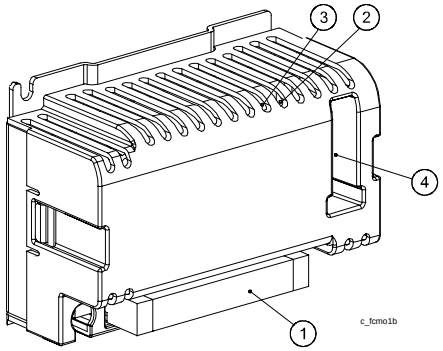
1 Description of the Inverter

Do not touch any circuit components while the main AC power is on. High voltages are supplied to the inverter (including the programming switches). Wait for at least three minutes after the supply voltage has been switched off before performing any service on the unit. Failure to adhere to this warning can result in injury.

1. Terminal X1
2. Red led (fault)
3. Green led (ok)
4. Programming switches



Inverter cooling is optimal when the air flows through the device from the bottom to the top. If the inverter is mounted sideways, the output current must be de-rated by 40%.

1.1 Connections

The necessary supply voltage for the inverter is 380/480V 50/60Hz. For other available three phase voltages, a transformer is provided to supply the proper power to the inverter.

Power and control circuit connections are made to terminal block X1 as follows:

Number	Name	Description
1	PE	Ground
2	L1	Power phase 1. 380-480V 50/60Hz.
3	L2	Power phase 2. 380-480V 50/60Hz.
4	L3	Power phase 3. 380-480V 50/60Hz.
5	U	Motor phase 1.
6	V	Motor phase 2.
7	W	Motor phase 3.
8	S1	Drive command. Direction 1. 48V or 115V 50/60Hz
9	S2	Drive command. Direction 2. 48V or 115V 50/60Hz
10	SP2/AP	Speed 2 / Acceleration command. 48V or 115V 50/60Hz
11	ON	Control voltage, neutral.

WARNING! Inverter must not be connected to following types of power sources:

- Isolated ground system
- High-impedance grounded system
- Phase grounded/grounded leg system.

Use the special, modified version for these power supplies. See product code.

A minimum of two collectors for each runway conductor shall be furnished with inverter use.

1.2 Normal Operation for Trolley/Crane

The CMX inverter goes into Ready-to-Run within one second after power is applied to the inverter. During running, CMX 007 follows the user defined speed control mode (Section 2.2). The default speed control mode is the Two-step Infinitely Variable (EP-2). The stopping method, which the user cannot change on CMX 007, is always Decelerate at STOP command (dynamic braking). During an immediate direction change, the brake is always kept open. When the RUN Forward/Reverse command is removed, the inverter decelerates to zero according to its preset ramp time and then the brake sets.

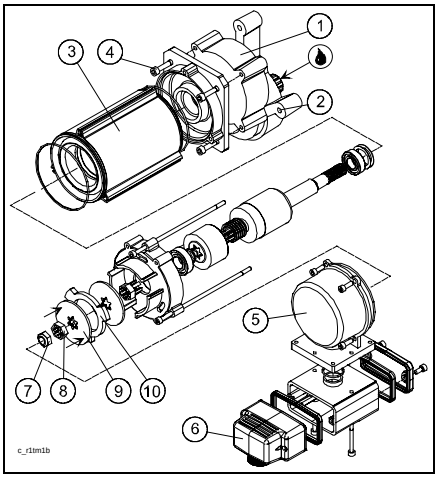
1.3 LED Status Indicator

CMX indicates its operating status by two LEDs. A steady green LED indicates Ready-to-Run. A blinking green LED indicates that a fault condition had been active, but the fault has since recovered (See Section 3). Normal operation is possible when the green LED is blinking. A blinking red LED indicates a severe fault condition and operation is inhibited. The blinking pattern tells the user the type of fault that has occurred. (See Section 3).

1.4 Compact Brake Motor

CMX 007 is used only with the MF06 compact brake motors. These compact brake motors are specially designed for inverter use only. The compact brake motors have the following special features:

- The motor brake is opened by the magnetic force of the energized motor. When the magnetic force is removed (by cutting off the motor current), the brake is closed by a spring force.
- High nominal frequency (80Hz…120Hz)



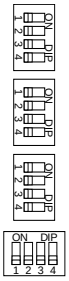
2 Programming Parameters

Do not touch any circuit components while the main AC power is on. High voltages are supplied to the inverter (including the programming switches). Wait for at least three minutes after the supply voltage has been switched off before performing any service on the unit. Failure to adhere to this warning can result in injury.

Before shipping the unit to you, the parameters are set at the factory, which may be different from the default settings, to meet the performance requirements for your crane application.

CMX uses DipSwitches to program the features. The state of each switch is either OFF (0) or ON (1). There are five parameters that are possible to set by switches S1 through S4.

Switch S1 = Maximum speed, upper frequency output setting
Switch S2 = Minimum speed, lower frequency output setting
Switch S3 = Acceleration / Deceleration Ramp Time
Switch S4 = Control Mode (S4-1) and Motor Parameters



2.1 Speeds and Ramp Time Selections

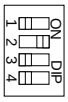
2.1.1 Frequency Output Selection (Set Switches S1 and S2)

The minimum and maximum speeds are selected by setting the minimum output frequency and the maximum output frequency. Switch S1 sets the maximum output frequency selection and Switch S2 sets the minimum frequency selection. Table “A” is used for the 100/120Hz motors and table “B” for the 80Hz motors.

Switch S1 / S2				SPEED TABLE A (100/120Hz motors)		SPEED TABLE B (80Hz motors)	
-1	-2	-3	-4	Max speed, S1	Min speed, S2	Max speed, S1	Min speed, S2
0	0	0	0	100 Hz	29 Hz	77 Hz	22 Hz
0	0	0	1	50 Hz	14 Hz	42 Hz	14 Hz
0	0	1	0	62 Hz	23 Hz	50 Hz	18 Hz
0	0	1	1	54 Hz	10 Hz	40 Hz	10 Hz
0	1	0	0	80 Hz	32 Hz	62 Hz	30 Hz
0	1	0	1	58 Hz	12 Hz	44 Hz	12 Hz
0	1	1	0	66 Hz	16 Hz	46 Hz	16 Hz
0	1	1	1	70 Hz	18 Hz	48 Hz	20 Hz
1	0	0	0	115 Hz *)	50 Hz	80 Hz	40 Hz
1	0	0	1	75 Hz	20 Hz	53 Hz	24 Hz
1	0	1	0	85 Hz	26 Hz	56 Hz	26 Hz
1	0	1	1	90 Hz	35 Hz	59 Hz	28 Hz
1	1	0	0	95 Hz	38 Hz	65 Hz	32 Hz
1	1	0	1	105 Hz *)	41 Hz	68 Hz	34 Hz
1	1	1	0	110 Hz *)	44 Hz	71 Hz	36 Hz
1	1	1	1	120 Hz *)	47 Hz	74 Hz	38 Hz
***) 100 Hz may be exceeded only if voltage to inverter is 460-480V.**							

EXAMPLE OF PARAMETER SETTING:

80Hz motor is connected to the inverter and 62Hz maximum speed is desired. That speed is located on the 5th row in the speed table B. The corresponding setting for S1 switches is in the same row in the leftmost columns of the table: 0-1-0-0 (off-on-off-off).



S1

Max speed set to 62Hz.

2.1.2 Acceleration and Deceleration Ramp Time

The acceleration and deceleration ramp times are set by switch S3 as follows:

Switch S3				Acceleration/deceleration
-1	-2	-3	-4	ramp time
0	0	0	0	2.5 sec
0	0	0	1	3.5 sec
0	0	1	0	3.0 sec
0	0	1	1	5.0 sec
0	1	0	0	2.0 sec
0	1	0	1	8.0 sec
0	1	1	0	1.0 sec
0	1	1	1	7.5 sec
1	0	0	0	1.5 sec
1	0	0	1	4.0 sec
1	0	1	0	7.0 sec
1	0	1	1	6.5 sec
1	1	0	0	4.5 sec
1	1	0	1	6.0 sec
1	1	1	0	5.5 sec
1	1	1	1	0.5 sec

The default setting for the acceleration and deceleration ramp time is 4.0 seconds. The acceleration ramp time always equals the deceleration ramp time.

CMX 007 stopping method is always the Deceleration at STOP command (dynamic braking) and extreme caution should be used taking into consideration the value of switch S3. If the deceleration time is too long, crane/hoist can crash into the end stops, causing damage to equipment or injury to personnel.

2.2 Speed Control Mode

CMX 007 provides the user with the flexibility for selection of either a Two-step Multi-Step Speed Control (MS-2) or a Two-step Infinitely Variable (EP-2) mode. Speed control mode is set by Switch S4-1. The default speed control selection is the Two-step Infinitely variable (EP-2).

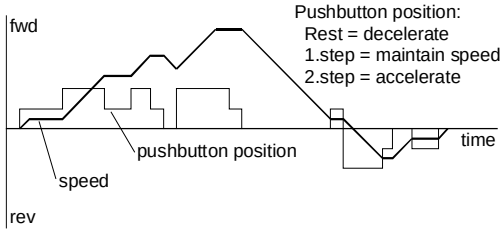
Multi-Step Speed Control Mode (MS-2) (S4-1 = OFF)

CMX 007 provides for only 2 speeds in the Multi-Step Speed Control Mode and for Decelerate at STOP command stopping method.

- S1 input is “RUN forward”. Frequency output increases to frequency (minimum speed) set by DIP switch S2. Operation continues at this frequency (minimum speed).
- S2 input is “RUN reverse”. Frequency output increases to frequency (minimum speed) set by DIP switch S2. Operation continues at this frequency (minimum speed).
- SP2 input/second speed command. Frequency (speed) output increases to frequency (maximum speed) set by DIP switch S1. Operation continues at this frequency (maximum speed).
- Removal of SP2 input/second speed command. Frequency (speed) output decreases to frequency set by DIP switch S2. Operation continues at this frequency (minimum speed).
- Removal of S1 input and S2 input, Run Forward/Reverse. Deceleration at STOP command, and then brake sets.

Two-step Infinitely Variable Speed Control (EP-2) (S4-1 = ON)

CMX 007 provides for Two-step Infinitely Variable Speed Control and Decelerate at STOP command.



- S1 input is "Run forward". Frequency output increases to frequency (minimum speed) set by DIP switch S2. Operation continues at this frequency (minimum speed).
- S2 input is "RUN reverse". Frequency output increases to frequency (minimum speed) set by DIP switch S2. Operation continues at this frequency (minimum speed).
- AP input is acceleration. Frequency (speed) output increases. The longer this contact is closed, the higher the speed output becomes. Limited only by the setting if DIP switch S2.
- During run time S1 input and S2 input is hold speed. Frequency output remains constant.
- Removal of S1 input and S2 input, RUN Forward/Reverse. Decelerate at STOP command. Output frequency decreases and the inverter decelerates to zero, and brake will set.

2.3 Motor Parameters

The motor parameters are selected by setting switches S4-2, S4-3 and S4-4. The motor parameters must correspond to the motor type being used. The motor parameters are selected as follows:

Switch S4			Motor type	Nominal frequency	Nominal Motor power
-2	-3	-4			
0	0	0	MF06MA200	100Hz (120Hz)	0.3kW (0.37kW)
1	0	0	MF06MA100	80Hz	0.45kW
0	1	0	MF06LA200	100Hz (120Hz)	0.45kW (0.55kW)
1	1	0	MF06LA100	80Hz	0.45kW (0.55kW)
0	0	1	2*MF06MA200	100Hz (120Hz)	2*0.3kW (2*0.37kW)

3 Fault Codes and Troubleshooting

Do not touch any circuit components while the main AC power is on. High voltages are supplied to the inverter (including the programming switches). Wait for at least three minutes after the supply voltage has been switched off before performing any service on the unit. Failure to adhere to this warning can result in injury.

If CMX malfunctions, a fault lamp blinks on and off. The blinking pattern continues until a new fault occurs or until power is switched off. The fault codes are explained in the table below.

LED Color, Blinking Pattern	Possible cause.	What to do.
GREEN	**Overvoltage.** Supply voltage exceeds the specification allows.	Lower input voltage.
GREEN	Deceleration ramp time is too short.	Extend Deceleration time.
GREEN	**Stall supervision / overcurrent.** Brake does not open properly or an obstacle is on the track. Incorrect motor dependent parameter setup.	Adjust air gap. Repair/replace brake. Check that the motor parameter settings (switch S4) are made according to the supplied motor(s). Section 2.3
GREEN	**Deceleration ramp supervision**. Deceleration ramp has not been followed. Power voltage exceeds specification allows.	Reset to longer Deceleration ramp time. Check the voltage of all supply phases at the terminal X1.
GREEN	**Inverter overtemperature**. Motor current is too high (bearing problem, obstacle on the track, brake does not open properly). Ambient temperature is too high.	Repair bearing problem. Remove obstacle. Adjust air gap or repair or replace brake. Use a larger rated inverter.
GREEN	**Undervoltage.** Supply voltage < specification allows	Correct the input power supply problem. Check for single-phase problem.
RED	**Short circuit.** Break down in motor cable insulation. Break down in motor winding insulation.	Switch main power off. Replace the motor cables. Check motor resistance. Replace the motor.
RED	**Microprosessor fault.** Due to high electrical noise environment.	Switch power off for 10 seconds, then back on.

NOTE! The latest active fault is always removed from the memory when power is switched off.

Drive will not run even though inverter is not in a fault condition:

- ✓ Motor will not start if DC-bus voltage too high (above 745V), this occurs if any line-to-line voltage exceeds 480V+10% = 528V. If line voltage cannot be reduced, install step-down transformer.
- ✓ Check the supply voltage phases at terminal X1.
- ✓ Check the control signals at terminal X1.
- ✓ Check that the control voltage is correct. Rating plate is located on the left side of the inverter.
- ✓ Check all parameter selections, especially the motor parameters (switch S4).
- ✓ Check that the selected motor parameters (switch S4) correspond to the proper motor type.
- ✓ Check that the microprocessor starts running. Both the green and red indicator LED's blink once as the inverter is powered up. After the one second initializing-time only the green LED should be light.
- ✓ Check that the brake opens and closes properly. Check the brake air gap.

4 Wiring Specification

4.1 Wiring Practices

- Do not connect incoming three-phase AC power to the drive output terminals U, V or W.
- Do not ground the AFD with any large-current machines.
- Before you use any welding or high-current machines near the crane, disconnect all line and ground wiring.
- Do not use output contactors between the AFD and the motor.
- Do not connect power factor correction capacitors to the drive input or output.
- Before turning on the AFD, check the output circuit (U, V, and W) for possible short circuits and ground faults.
- When using more than one transformer for the AFD's power, properly phase each transformer.
- To reverse the direction of rotation, interchange any two motor leads (U, V, or W). Changing input leads (L1, L2, or L3) will not affect the shaft rotation direction.) Ensure that the motion is in proper direction with respect to the push button being pressed.
- AFD line voltage inputs (L1, L2 and L3) are voltage specific. Do not connect the wrong voltage to the unit.
- A minimum of two collectors for each runway conductor shall be furnished with inverter use.
- Always mount the AFD in its proper vertical orientation so that the unit cools from bottom to top.
- Keep AFD heatsink clear of any obstructions (components on panel) to ensure proper cooling airflow.